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ABSTRACT

The rates at which men and women attend graduate and professional school were compared in a large national sample of college seniors followed up a year after graduation. Women attended less often, even women with very high grades. Women were particularly underrepresented in law and medicine. When the attendance rates of individuals who had planned to continue their educations the year after college were compared, women followed through with their plans less often. Analyses designed to identify variables related to attendance and following through with plans suggested a long term lower level of confidence among the women. (Author)

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Entrance of Women to Graduate and Professional Education

Leonard L. Baird

Educational Testing Service

It is generally agreed that it is an important goal to increase the numbers of women in the professions on college faculties and in scientific and scholarly occupations for a fair and just society. However, it is also an important goal because of society's need to use its resources of human talent. The implementation of this goal requires that larger numbers of women enter higher education and larger numbers enter graduate and professional education.

Research has shown that, although they have better academic records, women have traditionally less often applied to or entered college (Feldman and Newcomb, 1969, refer to 38 references), have more often withdrawn from college (see Tinto, 1975, for the most recent review, and Astin, 1975, for the most comprehensive recent evidence), and have less often planned advanced degrees (cf., Davis, 1965; Astin and Panos, 1969). However, there is little recent information about the extent to which women attend graduate or professional school.

The purpose of this study is to analyze information from a large, recent sample of college seniors, who were followed-up a year later to answer three questions: 1) Do women attend graduate and professional school as frequently as men do?; 2) Among seniors who planned to continue their education the next year, do women follow through with their plans as often as men do?; and 3) If there are differences in the rates of entrance and following through with plans for advanced education, are there any variables which are related to the differences?

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Data sources. The data for this study comes from a follow-up of a national survey of a sample of college seniors who replied to a questionnaire, The College Senior Survey, in the spring of 1971 (Baird, Clark, & Hartnett, 1973). Some 7,734 seniors in 94 colleges across the country were followed up in late spring of 1972 to determine their activities. Analyses indicated the sample included proportionately slightly fewer minority students than did the nonrespondents, but the sample did not seem to be biased in any other way, and included an extremely wide variety of students.

The Senior Survey covered a great deal of biographical, personal, attitudinal and educational information about students, including their specific plans for study the next year (Baird, Clark, & Hartnett, 1973). The follow-up questionnaire ascertained students' educational and vocational activities, including their specific fields of study (Baird, 1974).

Method. To answer the first question above, the simple frequencies and percentages of men and women in each form of post-graduate activity were compared. To answer the second question, we compared the percentages of men and women who had planned to pursue graduate or professional education in specific fields who were actually doing so a year later. The overall percentages of those who had planned to pursue advanced study, who were in some form of advanced study were also compared. To answer the third question, the senior survey responses of women who went to graduate or professional school were compared with those who did not. In addition, the responses of women who followed through with their plans were compared with those of men who followed through. Standard survey comparison techniques (Simon, 1971) were used in all analyses.

Results

The pattern of activities a year after college graduation was considerably different for men and women. More women than men were working full-time (66.7 to 55.2 percent), and more were working part-time (13.9 to 10.2 percent). Of course, women served in the military much less often (.3 to 8.5 percent). Overall, women less often pursued graduate or professional study (25.4 to 37.9 percent). A larger proportion of women than of men were studying arts and humanities (4.6 to 2.9 percent). The proportions of men and women studying social science (3.5 to 3.4 percent) and other fields (11.8 to 10.9 percent) were about equal. Fewer women than men were studying a biological or physical science (2.5 to 5.9 percent). Women were much less often enrolled in the professional schools of business (.7 to 4.2 percent), law (1.3 to 5.4 percent) and medicine (1.1 to 5.2 percent). Most of these differences are highly consistent with the differences in the plans of men and women reported by Baird, Clark, and Hartnett (1973), who found that women obtained higher grades than men but that only 29.3 percent of the women compared to 44.4 percent of the men planned to pursue advanced study the year following graduation. The differences in plans to enter law and medicine were even more extreme.

The extent of the influence of sex on graduate and professional school attendance is shown in Table 1. The entries show the percentages of men and women with particular grade averages in college who were attending graduate or professional school a year after graduation. There is a difference in attendance rates even among the students with the best grades; in fact, the women who had A to A+ grades attended graduate or professional school only about as often as men with B grades. These differences are lessened, but are still

sizeable when only men and women who planned to pursue advanced studies are studied. The differences in the rate with which men and women implement their plans are discussed next.

Overall, as surveyed a year later, 56.7 percent of the men in contrast to 41.2 percent of the women were in the field of advanced study they had planned to enter as seniors, a difference of 15.5 percent. In other analyses, we found that 18.2 percent of the men and 23.1 percent of the women who had planned to enter graduate study were in advanced study in a field other than their planned field. A quarter (25.1 percent) of the men who had planned to continue their educations were not doing so; over a third of the women (35.4 percent) were not doing so. Many of the women entered education; nearly a quarter of the women in graduate or professional school were in education in contrast to approximately 6 percent of the men.

Altogether, about three-quarters (74.9 percent) of the men who had planned to pursue advanced study were in graduate or professional school, whereas less than two-thirds (64.6 percent) of the women who had planned to pursue advanced studies had done so a year later. Thus, compared to men, women less often planned advanced study, and when they did plan to go on, less often actually did so, and, when they went on, less often entered the field they had planned.

How can we account for these differences? The senior data showed that women who had planned to go on to advanced study in graduate and professional schools had undergraduate grades superior to those of the men who had planned to go on. They came from somewhat better educated and more affluent families. However, they expressed less confidence in their ability to complete advanced

work, their ability to get A's in graduate or professional school, and their chances to rank among the best in their class in graduate or professional school.

The women's sense of confidence was lower in other areas, too, even when their performance equaled or excelled that of the men. For example, there were consistent differences even between the men and women who went on to advanced study. These women had held as many positions in student government as had the men, had been elected to as many offices, and had worked just as actively in political groups and student movements. Yet, the same women rated themselves significantly lower than the men in leadership and speaking ability and the ability to act when limited facts are available. The women had more often independently read scholarly books in their field, read other books unrelated to their courses, attended scholarly meetings in their field, and won prizes, awards or special recognition for work in their fields. Yet, the women rated themselves lower than did the men in scholarship, mathematical ability, writing ability, and scientific ability.

It seems clear that women, even those who go on to advanced study, have a lower sense of confidence in their ability to handle difficult work than do the men. (Maccoby and Jacklin [1974] have summarized research which shows that women have less confidence in handling new tasks, although their general self-esteem equalled that of men.) Why? We do not have the kind of data needed to answer this deceptively simple question, but we do have some clues. Compared to the men, the women who went on less often reported that their parents had often encouraged them to attend graduate or professional school. Of course, studies at several levels indicate that women seem to feel less encouragement (and pressure) from their parents for educational attainment. Probably

beginning in their early years, the women did not receive, as strongly as the men, the unspoken and subconscious message that they were able and that considerable accomplishments were expected of them. (Maccoby and Jacklin find more evidence for ideas of sex typing than for differences in actual child rearing practices.)

Discussion

One of the goals of a just admissions system is to admit the most capable and motivated students, whatever their backgrounds. What can be done to be sure that capable and motivated women will be able to go to graduate or professional school? Unfortunately, there are few suggestions for changes at the graduate or professional school level from our results. Finances do not seem to be the problem. Women seemed to have just as much access to fellowships and scholarships as men, and women held assistantships just as often. Men and women in advanced study worked to about the same extent. Nor is counseling a panacea. Analyses of the senior data indicated that men and women reported about the same degree of encouragement from faculty, and they considered the same sources of advice to be valuable in deciding about future plans. The differences in the attendance patterns do not seem to be easily explained by anything that could be affected by a simple change in the practices or policies of the graduate or professional schools. Rather, the differences seem to be due to a long term lack of confidence among many women, which may be difficult to change. Changes in policies at the graduate level will certainly help, particularly changing the kind of frankly sexist attitudes held by some professors and department chairmen that Heiss (1970) found. However, it seems

that the differences between men and women at the graduate and professional school level will be eradicated only as part of a general change in our society's attitude toward women, and women's own attitude toward themselves. In lieu of such changes in the near future, capable college women should be given more encouragement to consider graduate or professional school than they are now. Perhaps counseling, information, or awareness programs could increase the numbers of college women who apply for advanced study.

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Table 1

Percentage of Men and Women Graduates Enrolled in Graduate and Professional School According to Undergraduate Grades

	Grades				
Sex	C, Below	C+	B	B+	A to A+
Men	12	23	45	56	70
Women	12	15	22	31	47

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DESCRIPTORS *Cognitive Processes; College Students; Decision Making Skills; *Evaluative Thinking; *Performance Factors; *Predictive Measurement; Research Projects; *Retention; *Task Analysis

ABSTRACT

A combination of information integration methodology and measures of retention was used to investigate how subjects differentially attend to and weight information in judgmental tasks. Subjects were shown sets of test scores for hypothetical students and were asked to rate the performance of each student or predict each student's performance on a comprehensive final exam. Subjects given the prediction task showed a recency effect--their predictions were weighted more heavily by the second half of the scores than by the first--and tended to discount a deviant score. Subjects given the rating task showed a recency effect only when explicitly told to take into account trends in scores. The prediction group that showed the most discounting of deviant scores was also the group that had the highest rate of recall of deviant scores on tests of retention. Discounting thus appears to be an active process, rather than a lowered level of attention. (Author)

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Information Integration, Retention, and Levels of Information Processing

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A combination of information integration methodology and measures of retention was used to investigate how subjects differentially attend to and weight information in judgmental tasks. Subjects were shown sets of test scores for hypothetical students and were asked to rate the performance of each student or predict each student's performance on a comprehensive final exam. Subjects given the prediction task showed a recency effect--their predictions were weighted more heavily by the second half of the scores than by the first--and tended to discount a deviant score. Subjects given the rating task showed a recency effect only when explicitly told to take into account trends in the scores. The prediction group that showed the most discounting of deviant scores was also the group that had the highest rate of recall of deviant scores on tests of retention. Discounting thus appears to be an active process, rather than a lowered level of attention.

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The information integration approach (Anderson, 1974) has proved quite useful in describing complex cognitive processes with simple algebraic models. In many instances, the descriptive models of information integration theory have been shown to be superior to normative models in explaining and interpreting performance in human judgment tasks (Anderson, 1974; Levin, 1975; Shanteau, 1972). That is, the descriptive models provide a more fruitful framework for operationalizing and quantifying the effects of variables that affect judgmental and decision processes.

While providing an adequate quantified description is an important step in understanding human judgments, it is also important to investigate the underlying structure of the process captured by the descriptive model. Thus, for example, it would be of interest to relate the differential weighting of different components of information to the information integrator's tendency to attend differentially to these different components. This is analogous to the old problem of identifying functional, as contrasted with nominal stimuli in learning tasks.

A recent study by Levin (1976b) will help to formalize this problem and lay the groundwork for the new study to be reported in this paper. In this study subjects were asked to make judgments about each of a series of sets of numerical scores. This follows earlier work in "intuitive statistics" (Anderson, 1968; Levin, 1975; Peterson & Beach, 1967). Some of these sets contained an "outlier" score that was deviant from the rest. In Experiment 1 the scores in a set were displayed simultaneously, and in Experiment 2 the scores were displayed serially. Each experiment included a "descriptive condition" where subjects were asked to estimate (subjectively) the mean or average value of the scores presented in each set and an "inference condition" where subjects were aksed to infer the mean of the population from which

the set of scores represented a random sample. In Experiment 1--simultaneous presentation--the deviant or outlier scores were weighted at least as much as other scores in forming a descriptive judgment. But deviant scores were weighted less or discounted in forming an inference. This represents an experimental demonstration of the "intuitive" analog of descriptive and inferential statistics. However, in Experiment 2--serial presentation--the discounting effect was reduced (when subjects responded at the end of each sequence) or eliminated completely (when subjects were asked to adjust their responses following each new piece of information).

Levin concluded that subjects will discount a deviant score in making an inference from a sample to a population when they recognize such a score to be unrepresentative of the population. However, the ability to detect an unrepresentative score depends upon the way the information is presented.

The present study represents an attempt to replicate and extend the findings of the Levin (1976b) study with regard to the distinction between intuitive descriptive and inferential statistical judgments. In addition, the present study represents an initial attempt to develop a method for measuring how subjects attend to the various components of an information integration task. The method involves a combination of information integration methodology and measures of retention. Anderson and Hubert (1963) also used a recall task in conjunction with an information integration task, but, in contrast to the present methods, their subjects were forewarned that they would have to recall the material presented.

In the present study subjects were not forewarned that they would be tested for recall. Subjects were given a series of sets of eight numbers each, where the numbers in a set were said to be a succession of test scores for a student. Some subjects were told to rate the performance of each

student in relation to the other students (analogous to the descriptive condition of the previous study), and some subjects were asked to predict the performance of each student on a subsequent comprehensive final exam (analogous to the inference condition of the previous study and the guess condition of Anderson, 1968). Following a number of such rating trials or prediction trials, subjects were given additional sets of scores and were then asked (without pre-cuing) to recall the scores they had just seen or estimate the trend present in the scores. The retention measures should then provide evidence on how the subjects were using information in the judgmental (integration) tasks.

METHOD

1. Construction of stimulus sets

   a. 9 sets were formed by factorially manipulating the mean of the first 4 scores (M1 = 50, 60, or 70) and the mean of the second 4 scores (M2 = 50, 60, or 70). All scores in these sets were within 10 points of the mean of the set.

   b. 4 sets were formed which contained deviant scores. These sets had a mean of 60 and the deviant score was approximately 25 points above or below the mean and appeared in the first half or second half of the scores.

   c. End anchors, practice trials, and filler sets were included.

2. Instructional conditions

   a. Group 1 (n = 17 students from introductory psychology classes at the University of Iowa): Subjects were asked to rate the performance of each student using a 20-cm. graphic (line-mark) rating scale (converted to a 20-point scale) labeled "very good" and "very bad" at the extremes. These subjects were told that each score should be of equal importance in rating performance.

b. Group 2 (n = 19): Subjects were asked to rate the performance of each student using the above scale. In addition, they were told to take into consideration whether or not the student showed improvement over the course of the semester.

c. Group 3 (n = 20): Subjects were asked to predict the performance of each student on a comprehensive final exam using the same graphic scale as the other groups.

d. Group 4 (n = 17): Subjects were asked to predict final exam performance as in Group 3, but, in addition, they were told that occasionally a student will have an unusually "good" or "bad" day that may not necessarily be a good predictor of subsequent performance. These additional instructions were designed to promote discounting of deviant scores.

3. Retention questions (following 25 trials of the information integration task)

a. Trend question: After making their rating or prediction response to a set of scores where M1 = 74 and M2 = 61, subjects were asked to indicate whether the first half or the second half of the scores was higher.

b. Uncued recall: After making their rating or prediction response to a set of scores containing an "outlier," subjects were asked to write down as many of the numbers in the set as they could recall. (The order of presentation of the trend question and the uncued recall was counterbalanced across subjects.)

c. Cued recall: On the final trial of the experimental session, the subjects were told ahead of time that they would be asked to recall the scores in the next set. This was included to provide a baseline

for examining the uncued recall and to provide a basis for analyzing the comparability of the various groups.

4. Procedures and time intervals

The eight numbers in a set were printed on 7 x 22" cards which were held up by the experimenter for a period of 8 sec. Subjects were given approximately 5 sec. to respond in Part 1 (information integration task) and 30 sec. to respond in Part 2 (retention task). Subjects were tested in groups of 8 to 10.

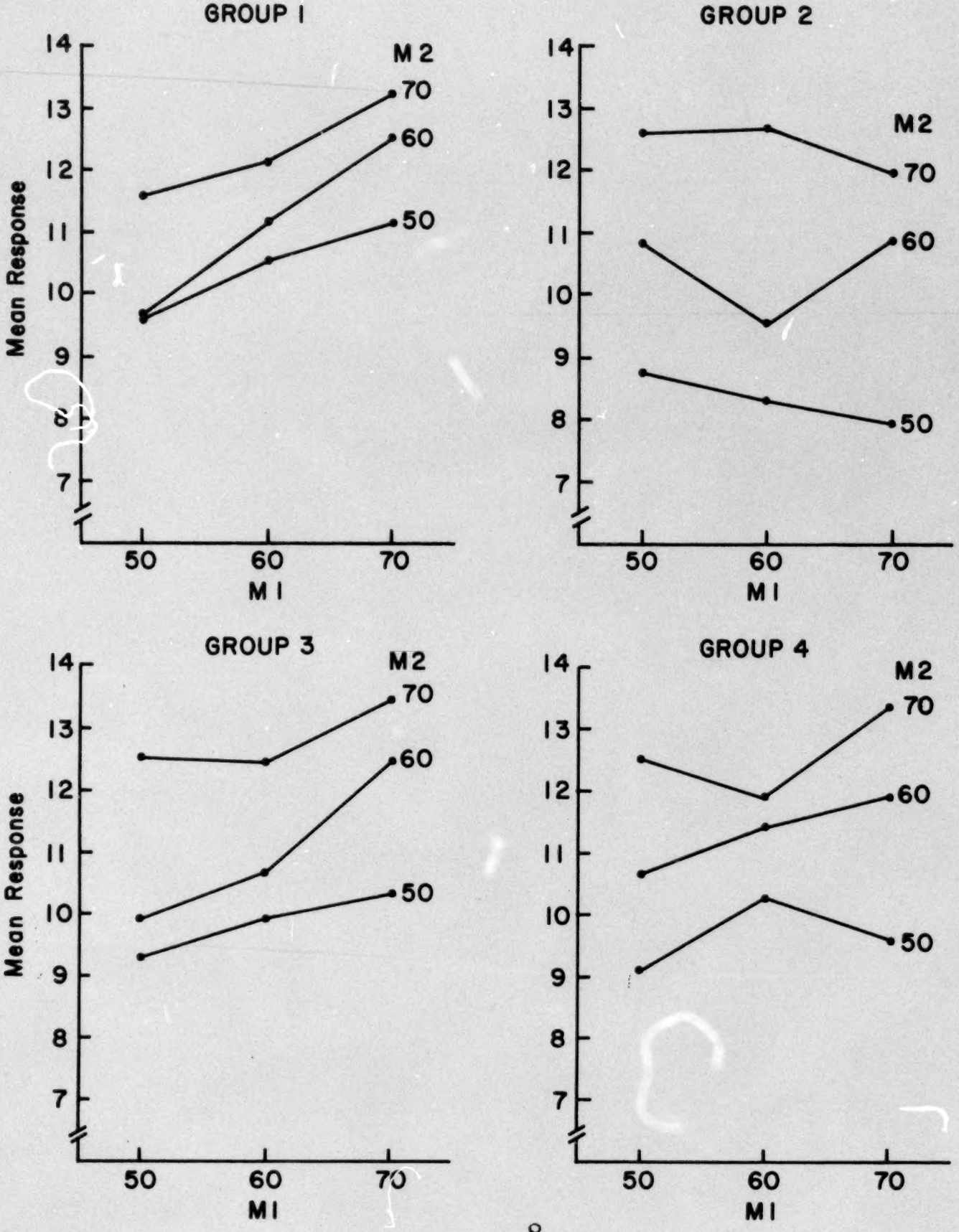
RESULTS

1. Information integration analysis of responses to sets without deviant scores (see Figure 1)

   a. Group 1: Both M1 and M2 were significant sources of variance. The M1 x M2 interaction did not reach significance at the .05 level. There was no significant order effect. Results are consistent with a simple averaging model.

   b. Group 2: The M2 effect was large and statistically significant, but M1 did not approach statistical significance. The M1 x M2 interaction was significant. There was a large and statistically significant recency effect. Results are consistent with the notion that subjects (as instructed) took into account the trend in the scores, even to the extent of sometimes "penalizing" students who scored higher in the first half.

   c. Groups 3 and 4: M1 and M2, and M1 x M2 were significant sources of variance for each group. There was a statistically significant recency effect for each group (but not as large as in Group 2). Results are consistent with the notion that the most recent events (scores) are weighted more heavily in predicting future performance.


GROUP 1
GROUP 2
GROUP 3
GROUP 4
Mean Response
M1
M2
70
60
50
14
13
12
11
10
9
8
7
50
60
70

2. Information integration analysis of responses to sets with deviant scores (see Figure 2) Note: If responses to sets with + deviant score are lower than responses to sets with - deviant score, then this is evidence for discounting.

   a. Group 1: Deviant scores are weighted more than other scores (opposite of discounting) and this difference is statistically significant.

   b. Group 2: Deviant scores are weighted less than other scores, but this difference did not reach statistical significance.

   c. Group 3: Deviant scores are weighted less than other scores, but this difference reached statistical significance only when the deviant score occurred in the second half.

   d. Group 4: Deviant scores are weighted less than other scores, and this difference was statistically significant. Results are consistent with the notion that subjects tend to discount a deviant score in an inference condition when it is perceived to be unrepresentative of the population.

3. Retention task (see Table 1)

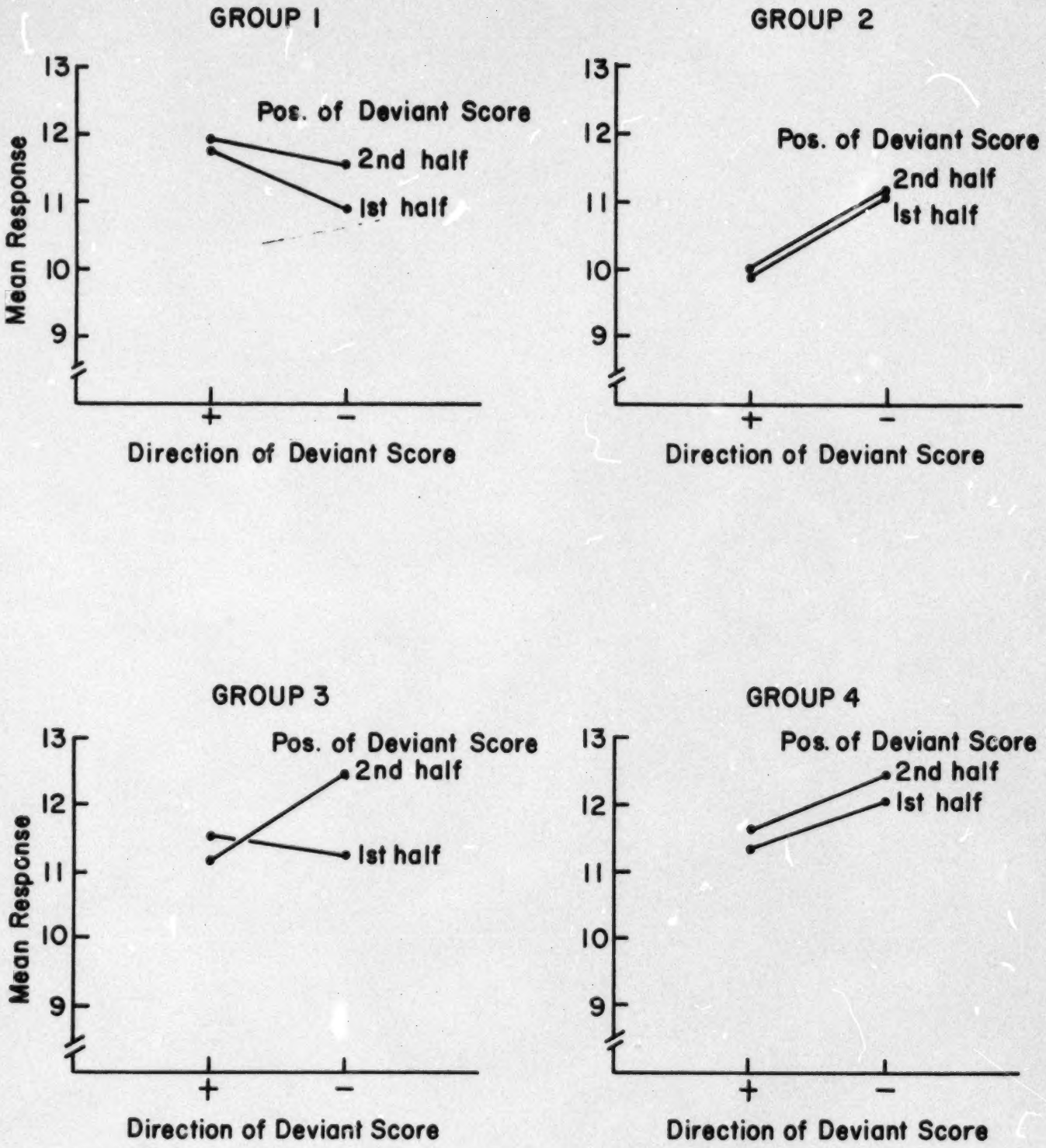
   a. Trend question: All groups performed at a relatively high level. There were no significant group differences. Conclusion: Since scores are probably read in left-to-right order and are said to represent performance on successive exams, subjects notice trends even when that information is irrelevant to their judgments (Group 1).

   b. Uncued recall: Overall performance (% correct) does not differ significantly or systematically across groups. The probability of correctly recalling the deviant score tended to be higher for the groups who showed the most discounting, but the differences were not significant.

Table 1

Summary of Responses on Retention Task

	Group			
	1	2	3	4
Trend question: % correct	76.5	73.7	75.0	82.4
Uncued recall: Mean correct (out of 8)	3.29	3.11	3.40	3.12
Uncued recall: % correct on deviant score	52.9	57.9	50.0	58.8
Cued recall: Mean correct (out of 8)	4.65	4.47	4.60	4.89
Cued recall: % correct on deviant score	41.2	31.6	45.0	64.7


GROUP 1
Mean Response
13
12
11
10
9
Pos. of Deviant Score
2nd half
1st half
+
−
Direction of Deviant Score
GROUP 2
13
12
11
10
9
Pos. of Deviant Score
2nd half
1st half
+
−
Direction of Deviant Score
GROUP 3
Mean Response
13
12
11
10
9
Pos. of Deviant Score
2nd half
1st half
+
−
Direction of Deviant Score
GROUP 4
13
12
11
10
9
Pos. of Deviant Score
2nd half
1st half
+
−
Direction of Deviant Score

c. Cued recall: All groups were comparable on overall performance and did approximately 50% better on cued than on uncued recall. The group with the most discounting (Group 4) had the highest rate of recall for deviant scores. (For cued and uncued recall combined, Group 4 had a significantly higher rate of recall for deviant scores than did other groups.)

d. Auxilliary finding: On uncued recall subjects recalled deviant scores at a significantly higher rate than other scores, but the reverse was true for cued recall. This is consistent with the notion that uncued recall taps the fact that deviant scores stand out and are noticed more, but in cued recall subjects attempt to maximize their probability of being correct by guessing items from the most frequent range of scores.

DISCUSSION

The results for the information integration task of the present study tend to support the findings of Anderson (1968) and Levin (1976b) who found differences between rating (or descriptive) tasks and prediction (or inference) tasks. Statistically significant discounting effects were found only in the prediction task of the present study. Another interesting finding was that recency effects were found in the prediction task.

There was no systematic relationship between the degree to which the various experimental groups displayed recency effects and their ability to identify trends on the retention task. Thus, the attempt to define a measure of retention which would show the extent to which subjects were attending to trends in the scores failed to account for performance differences in the integration task. However, as indicated, subjects may have developed a "set" to notice trends even when this information was irrelevant to their judgments.

The retention measure dealing with deviant scores was somewhat more informative. Group 4 had both the highest rate of discounting of deviant scores in the integration task and the highest rate of recall of deviant scores in the retention task. Thus, "discounting" can be described as an active process of attending to and systematically eliminating the deviant score -- i.e., assigning it a zero weight--rather than a lack of attention to the deviant score.

While the retention measures did not discriminate greatly between groups showing different integration rules, the present method of combining information integration methodology and retention measures seems promising. A number of earlier studies of information integration have shown different integration rules depending on whether information was presented simultaneously or serially (Anderson, 1973), the nature of instructions regarding the processing of deviant information (Anderson & Jacobson, 1965; Levin, 1976b), and the use to be made of the information presented (Levin, 1976a). In these cases, it would be particularly interesting to detect differences in the way subjects attend to (and retain) different aspects of the information presented. Such studies would serve to tie together the following research topics in human information processing: levels of information processing (Craik & Lockhart, 1972), information integration, and retention.

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